ABSTRACTS

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AMERICAN FISHERIES SOCIETY

"Building Resiliency into Fish Management Plans – Sustaining Fisheries in a Changing World"

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Otesaga Resort Hotel
Cooperstown, NY

PLENARY

Title: Resilience 101: concepts and examples from New York state fisheries.
Author: Brian Weidel
Affiliation: USGS, Great Lakes Science Center, Lake Ontario Biological Station

Abstract: In the context of resource management, the term 'resilience' usually evokes an immediate response, whether positive, negative or questioning. Although the concept and theories were developed in the 1970's and 1980's, their relevance seems to be increasingly recognized perhaps as a result of our better understanding of the complexity and uncertainty of social-ecological systems. This presentation will introduce and define some of the concepts that are needed to appreciate resilience and the adaptive cycle in managed ecosystems. Topics will include alternate stable states, system drivers interacting at different scales, the paradox of experts, and myths of nature. I'll draw on classic metaphors, as well as historical examples to illustrate these concepts. Where possible, I will incorporate examples drawn from New York fisheries in explanations. For instance, in Lake Ontario, management actions are attempting to increase that system's resilience by diversifying the prey fish community. In addition, I will describe how tools such as scenario planning can be used to address future uncertainty and identify actions that increase resilience.

Title: Resilience and recovery of marine fish populations: points of no-return and productivity regime shifts.
Author: Olaf Jensen
Affiliation: Rutgers University

Abstract: Managing for resilient fisheries requires, among other things, avoiding depletion of stocks to levels where recovery becomes long and uncertain. Of particular concern is the potential existence of Allee effects or a point of no return below which a population cannot recover. More broadly, knowledge of the factors that confer resilience, i.e., rapid recovery following depletion, could help in prioritizing management resources and determining risk tolerance for different species. Empirical analysis of a global database of marine fish stock assessments demonstrates that Allee effects are either rare or only occur at extremely low stock size. However, dramatic shifts in productivity unassociated with stock size are quite common. One of the most effective tools for achieving management goals in the face of uncertain and changing population size and productivity is the harvest control rule (HCR). HCRs are a system in which the management response to changes in a stock indicator is pre-negotiated, allowing for rapid response to changing conditions. While commonly used in marine fishery management, they have not yet been widely adopted for use in freshwater fisheries.

Title: Managing for evolutionary resilience.
Author: Matt Hare
Affiliation: Cornell University Department of Natural Resources

Abstract: Resilient fish management plans are those that succeed in building or maintaining resilient populations and facilitate adaptive management. Effective management plans need to be clear about objectives and the spatial and temporal scales within which those objectives are sought. With respect to population resiliency there is little value in setting objectives independently for different parts of a metapopulation because robustness and viability ultimately depends on patterns of connectivity, including extinctions and recolonizations. Similarly, I will argue that objectives focused exclusively on ecological resiliency (short time scales) miss an important opportunity to facilitate evolutionary responses of populations to changing environments. To an ecologist this might seem wrong-headed because population dynamics can respond rapidly to harvest and other manipulations, giving managers a set of sensitive tools that operate in the short term. However, one of the major insights from recent decades of research is that evolutionary responses to changed environments can be surprisingly rapid in natural populations.

Furthermore, a myopic focus on near-term population responses risks loss of resilience in the sense that evolutionary responses to harvest (or other manipulations) may be driving the population across a threshold to a new, less desirable state. To a manager the proposition evolutionary-scale management might seem unrealistic because the details of future environments are unpredictable and our ability to manage evolution in the wild is questionable. However, I will argue that management at evolutionary timescales is about facilitating evolutionary adaptive capacity and resilience, not predicting changing selection pressures and engineering a solution.

Title: Resiliency in the management of marine fisheries.
Authors: Russell W Brown, Dvora Hart and Liz Brooks
Affiliation: NOAA Fisheries Northeast Fisheries Science Center

Abstract: Marine fish and invertebrate populations levels are can be challenging to manage due to highly variable interannual recruitment success. Georges Bank haddock and north Atlantic sea scallop populations have exhibited extensive stock recovery, but the ability to establish resiliency in these two fisheries differs. The north Atlantic sea scallop fishery is one of the most valuable fisheries in the United States, recently generating between $400 and $500 million dollars in ex-vessel landings. The fishery is managed as a limited access fishery and extensive surveys are conducted through a research set-aside program which generates funds from scallop quota dedicated to research. Surveys detect new sets of scallops and these areas are closed to the fishery, closely monitored and opened for controlled harvest in order to maximize the sustainability and economic outputs of the fishery. The domestic and international markets for scallops are dynamic and sensitive to supply so maintaining a relative constant supply is critical to the resiliency of the fishery. Haddock populations experienced a relatively stable period of harvest between 1930 and 1960. An exceptionally large 1963 year class and excessive harvests by distant water fleets in the 1960's resulted in a sharp decline in populations by the early 1970s. Despite several promising year classes, the population remained at low levels declining to record low levels in the mid-1990s. Haddock populations have fully recovered due to the recruitment of record large year classes in 2003 and 2011, but the fishery is currently under harvesting due to restrictions on other species (Atlantic cod, yellowtail flounder). The mobility of these resources and the ability to selectively harvest populations are key reasons for differences in the ability to establish resilient fisheries.

Title: Climate change as a driver of the homogenization of New York's stream fish fauna.
Author: James R Jackson[1] and Doug Carlson[2]
Affiliation: [1]Cornell Biological Field Station, [2]NYSDEC

Abstract: Homogenization of fish faunas across landscapes has been attributed to widespread species introductions coupled with extirpation of endemic species. From 1927-1940, New York State conducted intensive watershed surveys of the State's fish fauna, which included 4058 stream sites. Stream surveys were conducted on a similar scale over the last two decades, and included 3057 sites. Frequency of occurrence data indicate significant changes in the distributional patterns of fishes between the two survey periods, and results of multivariate analyses are indicative of homogenization of the stream fish fauna across the state. Bray-Curtis similarity values show that the stream fish faunas in 13 of 18 watersheds are now more similar to the statewide fauna than historically. Similarity of individual watersheds to all other watersheds has increased in all cases. Examination of changes in large scale patterns of distribution reveals that species that have exhibited the greatest range expansions are those that prefer the warmest water temperatures and those species with the most marked contractions of range are those that are least tolerant of high water temperatures. These results show that habitat change associated with climate change is a significant driver of homogenization of the stream fish fauna of New York State.

Title: Stream corridor management: from planning to pile driving.
Author: George Fowler
Affiliation: Senior Project Engineer, Woidt Engineering and Consulting

Abstract: The treatment of our stream corridors has evolved from the refuse dumping and natural resource extraction practices in the early 20th century to conserving and enhancing the remaining aquatic life while promoting the surrounding anthropogenic communities in the 21rst century. Scant resources for aquatic species enhancement drive the need for planning that benefits both the target aquatic species and the towns and villages that neighbor our streams. Traditionally, the former is completed by biologists and natural resource planners while the latter is completed by engineers and urban planners. The growing field of fluvial geomorphology has created a bridge between the two tracts and allows for the flow of ideas about where informed interventions can be implemented to promote a healthy and thriving stream corridor. This talk will outline a Stream Corridor Plan beginning with the public planning process and ending with several intervention examples such as perched culverts, flood mitigation, engineered log jams and hyporheic connectivity.

Title: Managing *Percids* in Lake Erie, a New York State perspective.
Author: Donald W Einhouse
Affiliation: NYSDEC Lake Erie Unit Leader

Abstract: This presentation discusses how a long-standing cooperative framework for managing important walleye and yellow perch fisheries in Lake Erie has progressed within a complex and ever changing environment. In 1980 the Great Lakes Fishery Commission adopted the Strategic Plan for the Management of Great Lakes Fisheries which outlined a cooperative framework between state, federal, provincial and tribal agencies to monitor and manage Great Lakes fisheries. On Lake Erie this framework is used by five management jurisdictions to pursue inter-agency stock assessments and annually implement consensus-driven safe harvest limits for large and diverse yellow perch and walleye fisheries. To-date, sustainable fisheries have been achieved by adhering to commonly held fish community objectives for broadly shared fisheries resources while maintaining the necessary agility to implement new harvest decisions and regulations as needed. Although walleye and yellow perch fisheries in eastern Lake Erie (including New York waters) are small on Lake Erie's scale, they remain very prominent among New York State sport fisheries, ranking 3rd in statewide angler use. Sustainability has also been fostered by special recognition and management of smaller locally identifiable eastern Lake Erie stocks.

Title: Managing for resilience across the eastern brook trout historic range.
Author: Nathaniel Gillespie
Affiliation: Assistant National Fisheries Program Leader, USDA Forest Service

Abstract: Examining the status, threats and trends of brook trout across their Eastern range has moved from a subwatershed analysis to catchment scale and populations at the patch level. The Eastern Brook Trout Joint Venture is currently using these data to create a new prioritization process to help state and federal managers determine how to best address threats within the broad categories of land use, climate change and exotic species. In terms of providing ecological resilience for Eastern Brook Trout, expanding patch size and establishing or reestablishing patches represent clear objectives for the Joint Venture members. A variety of strategies that can help meet these objectives will be discussed, including conservations actions at the population, habitat and social levels. This discussion will include how the Eastern Brook Trout Joint Venture strategies to achieve ecological resilience have evolved over the past decade.

Title: Are lake trout ecologically resilient or not? – species, ecosystems, and management.
Author: Charles C Krueger
Affiliation: Michigan State University Center for Systems Integration and Sustainability

Abstract: Lake trout as a species has life history characteristics that assist resisting temporary perturbations and allowing population recovery. Resiliency characteristics include diet diversity - eating plankton to voles and birds, several reproductive age classes, low adult natural mortality, habitat diversity (lake and river spawning), and diversification into multiple ecomorphotypes that partition ecological resources across space and time. As a result, they can maintain viable populations even when reproductive failure occurs over several years because they do not depend on one or two reproductive age classes. Their resilience also is evident in presumptive use of glacial refugia and rapid colonization after glaciers receded. Whereas these advantages exist, lake trout are not resilient when challenged by the ecosystem changes wrought by invasive species such as sea lamprey and alewives or when suffering high levels of total mortality (> 45%) such as through fishing. In the early 1980s well before the popular use of the term "resiliency", NYSDEC, OMNR, and FWS embraced these resiliency characteristics within Lake Ontario lake trout management by setting objectives for multiple age classes, control of mortality (fishing and sea lamprey predation), and the introduction of several genetic sources of lake trout including putative shallow and deep water ecomorphotypes.

CONTRIBUTED – SESSION 1

Title: Fluctuations in rainbow and brown trout populations in a Finger Lakes tributary after stream habitat restoration.
Authors: Susan F Cushman[1], Nicolette E Andrzejczyk[1], Shannon M Beston[2] and Jordan L Youngmann[3]
Affiliation: [1]Department of Biology and Finger Lakes Institute, Hobart & William Smith Colleges [2]Department of Biology, University of Texas Arlington, [3]Department of Wildlife, Fisheries and Aquaculture Science, Mississippi State

Abstract: Streambank stabilization and creation of pool habitat was constructed in 2007 by NYDEC in Cold Brook, the major southern inlet to Keuka Lake (Hammondsport, NY), to increase success of spawning and rearing of the rainbow trout *Oncorhynchus mykiss* population. After restoration was completed, annual electrofishing and habitat surveys were conducted in pool habitats (restored and natural) at two sites from 2011-2015. It was hypothesized that larger restored pools would support spawning trout moving upstream from the lake and juvenile individuals throughout the year, showing responses in both increased average abundance and length. Restored pools were larger than natural pools (34.1 m^2 vs 18.3 m^2; $p<0.05$) although they did vary in size each year slightly. Rainbow trout catch ranged from 15-22 fish in natural and restored pools in earlier years but declined to less than 5 fish/pool in later years. Small fluctuations in brown trout *Salmo trutta* catch were observed (2-8 fish/pool) between 2011 and 2014 but was significantly higher in 2015. Abundance did not differ between natural and restored pools, however brown trout were much larger in restored pools. Brown trout may be outcompeting and/or preying on juvenile rainbow trout, and taking advantage of enhanced stream habitat year round. ***(Professional)***

Title: Migration and movement of American shad (*Alosa sapidissima*) in the Hudson River: a five-year study.
Authors: Christopher R Standley[1], Amanda L Higgs[1], P Christian Perry[2]
Affiliation: [1]NYSDEC Hudson River Fisheries Unit, [2]Cornell University Department of Natural Resources

Abstract: Declines in American shad (*Alosa sapidissima*) populations have occurred in the Hudson River since the 1800's. Tracking in-river migration of adults provides inference on spawning grounds and post-spawning survival, which are important parameters for developing recovery plans for diminished stocks. From 2009-2012 174 sonic tags were gastrically implanted in 45 male and 129 female American shad.

Daily movements were observed using stationary receivers and mobile tracking equipment through 2013. Stationary receivers were deployed from the Troy Dam to New York Harbor. In total, 172 tagged shad were detected across the five-year study period. Post-tagging fallback was observed in >70% of fish with a mean duration of 5.1 days (SD = 2.3, n = 111). Down-river forays ("dipping") were observed for 61 tagged adults, with movement oscillations ranging ca. 1-50 miles. Eight unique tags were detected in more than one year. Handling procedures likely influenced migratory behavior of tagged fish via observed post-tagging fallback, while oscillatory movements elicit a cornucopia of uncertainty regarding spawning ground selection and migratory behavior. Multi-year detections demonstrate post-spawning survival and iteroparous reproductive strategies of American shad populations in the Hudson River. ***(Professional)***

Title: Projected effects of dam passage performance standards on recovery of American shad (*Alosa Sapidissima*).

Authors: Dan Stich[1,2], Timothy Sheehan[2], and Joseph Zydlewski[3]
Affiliation: [1]SUNY College at Oneonta, [2]NOAA Northeast Fisheries Science Center, [3]USGS Maine Cooperative Fish and Wildlife Research Unit

Abstract: Poor passage and delay at dams can affect population structure and abundance of anadromous fishes, and has contributed to range-wide declines in Alosine stocks. Recovery actions commonly involve increasing passage performance and reducing delay at dams during upstream and downstream migration; however, quantitative approaches incorporating uncertainty in life-history and migration characteristics is often absent when setting passage performance standards. We describe a stochastic, life history-based simulation model for Alosines that can be used to estimate effects of dam passage and migratory delay on vital rates and demographic structuring of populations through space and time to support quantitative-based decisions. We examine projected American Shad (*Alosa sapidissima*) population responses to changes in dam passage performance in the Penobscot River, Maine in relation to recovery objectives. Recovery was achieved under high rates (90%) of upstream and downstream passage. Demographic tradeoffs, including reduced spawner abundance, resulted when downstream passage was less than 100% even at high rates of upstream passage. These results underscore the importance of providing adequate downstream passage for adult and juvenile migrants in addition to upstream passage for adults. Tradeoffs in recovery metrics resulting from interactive effects of upstream and downstream passage warrant consideration during decision-making processes at regulated hydropower dams. ***(Professional)***

Title: Response of fish assemblages to seasonal drawdowns in sections of an impounded river-canal system.

Authors: Scott George[1], Barry Baldigo[1], and Scott Wells[2]
Affiliation: [1]USGS New York Water Science Center, Troy, NY, [2]NYSDEC

Abstract: The Mohawk River and New York State Barge Canal flow together as a series of permanent and seasonal impoundments for most of the distance between Rome and Albany, NY. In the seasonally impounded sections, movable dams are raised during the winter and water is permitted to drain downstream, reducing the wetted surface area of the river by 36 to 56%. This investigation used boat electrofishing during the springs of 2014 and 2015 to compare the relative abundance and composition of fish communities between the permanently and seasonally impounded sections to determine the effects of the winter drawdown. A total of 3,927 individuals from 39 species were captured during the study. Total catch per unit effort (CPUE) ranged from 46.5 to 132.0 fish/h in the seasonally impounded sections compared to 89.9 to 342.0 fish/h in the permanently impounded sections. Mean CPUE in the seasonally impounded sections was significantly lower and community composition differed significantly between the permanently and seasonally impounded sections. The abundance of many nonnative lentic species decreased markedly in the seasonally impounded sections while the proportion of native individuals was slightly higher. Overall, the winter drawdowns in the seasonally impounded sections appear to reduce the relative abundance of fish and may adversely affect angling opportunities but may also create more natural riverine conditions that favor some native species. ***(Professional)***

Title: Niagara river habitat improvement projects: adaptive approaches to a high-energy system.
Authors: Timothy DePriest
Affiliation: NYSDEC Region 9

Abstract: Recent efforts to restore and improve aquatic and wetland habitat in the Niagara River have required design components that consider the combined effects of various forces which are somewhat unique to this dynamic, big-river system. Natural and manmade sources of energy have been addressed though construction of structures designed to manage the effects of these forces to achieve specific habitat goals. Striking the right balance between resiliency and flexibility of the constructed habitat features has been the main challenge in project design. This presentation will highlight recent projects that illustrate various approaches to habitat improvement in the Niagara and discuss some of the lessons and successes realized along the way. ***(Professional)***

Title: The feasibility of lake sturgeon microchemistry in the St. Lawrence River.
Authors: Seth A Love[1], Quinton E Phelps[2], Scott J Schluetter[3], and Rodger M Klindt[4]
Affiliation: [1]Southeast Missouri State University, [2]Missouri Department of Conservation, [3]USFWS, [4]NYSDEC

Abstract: Due to serious declines, a number of U.S. states and Canadian provinces have developed and implemented Lake Sturgeon (*Acipenser fulvescens*) recovery plans. As a component of their recovery efforts, the New York State Department of Environmental Conservation (NYSDEC) began stocking Lake Sturgeon fall fingerlings in 1995 to maintain, restore, and create populations in 12 river and lake systems within the state. While there does appear to be an increase in catch rates in the St. Lawrence River (below the Moses-Saunders hydropower facility), the origins and movement patterns of these fish are somewhat unknown. The objective of this study is to assess the feasibility of using pectoral fin ray microchemistry to determine environmental life history of Lake Sturgeon in St. Lawrence River. To accomplish this objective, a microchemical analysis (HR-ICPMS and LA-ICPMS) was conducted on both water samples from Oneida Hatchery and the St. Lawrence River and from Oneida Hatchery fin rays and known history fish. These analyses indicate that a Sr:Ca difference does exist between hatchery and wild origin fish, and suggests that microchemistry could be a tool to help better quantify natural recruitment and better evaluate movement patterns. ***(Student)***

Title: Distribution and morphology of larval cisco *Coregonus artedi* in Chaumont Bay, Lake Ontario.
Authors: Ellen George[1], Darran Crabtree[2], Brian Lantry[3], Matthew Hare[1], and Lars Rudstam[1]
Affiliation: [1]Cornell University Department of Natural Resources, [2]The Nature Conservancy, [3]USGS Lake Ontario Biological Station

Abstract: Cisco *Coregonus artedi* are an important prey fish for many Great Lakes predators, including lake trout *Salvelinus namaycush*. Their numbers have declined drastically in the last century due to the impacts of invasive species such as sea lamprey *Petromyzon marinus* and alewife *Alosa pseudoharengus*, overfishing, and habitat degradation. Chaumont Bay, New York contains one of the last known spawning populations of cisco in Lake Ontario. In 2014 the first confirmed cisco larvae in Chaumont Bay in decades were found. Larvae were sampled weekly using light traps and surface neuston net tows. Larvae were identified to species using both traditional visual methods and genetic barcoding of the mitochondrial CO1 gene. Visual identification of coregonine larvae was confounded by an extreme overlap of morphometrics between cisco and lake whitefish *Coregonus clupeaformis*. When using standard keys, 84.5% of Chaumont Bay cisco had the potential to be misidentified as lake whitefish based on myomere counts, pigmentation, and total length. Cisco larvae were widely distributed around Chaumont Bay, and after hatching moved quickly into nearshore locations away from spawning shoals. Understanding the early life history of Chaumont Bay cisco is instrumental in identifying recruitment limitations that may be affecting this poorly understood population. ***(Student)***

Title: Efficacy of environmental DNA to detect and quantify brook trout *Salvelinus fontinalis*, populations in streams of the Adirondack Mountains.
Authors: Barry P Baldigo[1], Lee Ann Sporn[2], Scott D George[1] and Jacob Bell[1]
Affiliation: [1]USGS New York Water Science Center, [2]Paul Smith's College

Abstract: Environmental DNA (eDNA) analysis is rapidly evolving as a tool for monitoring the distributions of aquatic species. Detection of species populations in streams is problematic because the persistence time for intact DNA fragments is unknown, and eDNA is diluted and dispersed by dynamic hydrological processes. During 2015, Brook Trout *Salvelinus fontinalis,* eDNA was analyzed from waters collected at 40 streams across the Adirondack Mountains where their populations were recently quantified. Study objectives were to evaluate sampling methods and the ability of Brook Trout eDNA to accurately predict the presence and abundance of local populations. Results from 3-pass electrofishing surveys indicate that Brook Trout were absent from 10 sites, and present in low (<100 fish/0.1 ha), moderate (100-300 fish/0.1 ha), and high (>300 fish/0.1 ha) densities at 9, 11, and 10 sites, respectively. Environmental DNA results correctly inferred the presence-or-absence of Brook Trout populations in 92.5% of the study sites and explained 44% of the variability in density and 24% of the variability in biomass of local Brook Trout populations. These findings indicate that eDNA is an effective tool for characterizing the presence or absence, and the abundance of Brook Trout populations in headwater streams across the Adirondack region and elsewhere. ***(Professional)***

Title: Identifying lake trout thermal and depth habitat preference with pop-up satellite tags.
Authors: Curtis Karboski, Dimitry Gorsky and Zy Biesinger
Affiliation: USFWS Lower Great Lakes Fish and Wildlife Conservation Office

Abstract: Lake trout (*Salvelinus namaycush*) are a biologically and recreationally important piscivore in Lake Ontario. Sea lamprey predation, alewife induced thiamine deficiency and changing lake characteristics have heavily reduced their numbers, necessitating stocking and sea lamprey control to maintain the population. Assessing the ways in which lake trout use different depths and thermal habitats can provide important information for management: however, there are few ways to accurately collect this type of data. As part of a larger study, we used continuous-logging pop-up satellite tags (PSATs), attached to 4 lake trout, to track depth and temperature preferences from April to August 2015. Preliminary analysis of these data indicate strong diel patterns in activity level. Depth and temperature data indicate high affinity for the hypolimnion and areas just below the thermocline, with periodic vertical excursions into the epilimnion. Through this research, we hope to understand more fully the interactions of these fish with an invasive species dominated food web, and their future in an ever changing system. ***(Professional)***

CONTRIBUTED – SESSION 2

Title: The population ecology of ammocoetes in three New York streams.
Authors: Thomas M Evans
Affiliation: SUNY ESF Department of Environmental and Forest Biology

Abstract: Although larval lampreys (i.e., ammocoetes) can be common in cool-water streams, reaching densities > 100 animals·m^{-2}, they often remain completely unseen. I captured and marked ammocoetes with visible implant elastomer (VIE) tags in three streams, and re-collected them at approximately monthly intervals (excluding November-April) for 18 months. VIE was successful at marking ammocoetes for > 1 year, although tags were lost upon maturation to the juvenile stage. Changes in length and weight data provided a basis to compute von Bertalanffy growth rates, condition indices, and mortality rates. Ammocoete growth rates, based upon multiple measures, differed among sites and across sampling dates. Use of von Bertalanffy growth curves was difficult because of the inability to age

ammocoetes directly; however, when length-frequencies could establish probable ages, estimates of ammocoete time to maturity were between 4 to 7 years. Mean annual mortality for all three streams combined was estimated to be 58% (SD = ±31%, n = 16), which is close to prior estimates of ~50% per annum for ammocoetes. Understanding ammocoete population ecology will help managers protect native lamprey populations while also better controlling invasive sea lamprey populations. ***(Student)***

Title: Invasive round goby diet patterns in upper St. Lawrence River coastal habitats.
Authors: Andrew Miano and John Farrell
Affiliation: SUNY ESF Thousand Islands Biological Station

Abstract: The invasive round goby has exhibited profound impacts on aquatic ecosystems due to its high abundance and aggressive behavior and ability to outcompete native fish species for space and food. We analyzed 120 round gobies from two size classes and three important St. Lawrence River spawning bays for both stomach content and $\delta^{15}N$ and $\delta^{13}C$ analysis to better understand their role and potential effects to native ecosystems, especially for extremely large individuals. Isotopic composition and diet did not significantly vary by site but we found that relatively small round gobies (45-130 mm) had a significantly different diet and isotopic signature than larger round gobies (130-235 mm). Stomach contents revealed that large round gobies consumed significantly more dreissenid mussels (36.5% of diet by weight) than small round gobies (21.9%). Additionally, isotopic and stomach content analysis support the hypothesis that gobies undergo an ontogenetic diet shift as they grow, with smaller gobies behaving as generalists and larger gobies acting as specialists preying primarily on dreissenid mussels. Our results indicate that smaller gobies have a greater potential to impact native ecosystems as they consume a more general diet, while larger gobies occupy a lower trophic level by specializing on dreissenid mussels. ***(Student)***

Title: When does an endangered/threatened fish species in NYS get down-classified?
Authors: Doug Carlson
Affiliation: NYSDEC

Abstract: Fish species classified as Endangered or Threatened in New York are sometimes able to recover from imperiled status. When they are benefactors of recovery programs, it is a logical step that, after achieving specified objectives, they will no longer be classified as such. In other instances the species, on their own, become more abundant or wide-ranging than thought possible, and this should also cause their classification change. There is a tendency, however, to not do this because models designed this purpose rarely achieve these kinds of results. Also, panels of experts for this purpose usually have conservative behaviors rather than taking bold steps. The reclassification of NY fishes is likely to begin in 2016-17, and the best way to insure a few bold steps is to have enlightened participants and to have scientific reports. Experts and reports would need to conclude that the fish are no longer likely to become extirpated, in the near future. Hence they are no longer Threatened or Endangered. Eastern Sand Darter and Deepwater Sculpin are two New York species that are candidate for this outcome. This presentation will appeal to participants who might engage in this process and guide it accordingly. ***(Professional)***

Title: Status of the last wild population of northern sunfish (*Lepomis peltastes*) in New York State: changes in the fish community and hybridization with bluegill (*L. macrochirus*) in Tonawanda Creek, Erie County.
Authors: David Sanderson-Kilchenstein and James Haynes
Affiliation: SUNY Brockport

Abstract: Wild northern sunfish have been restricted to a 3.7 km section of lower Tonawanda Creek (LTWC), Erie County, and the species is listed "threatened" in NY state. A recovery program has been carried out by NYSDEC since 2005 to reintroduce the species into historic waters and to establish new populations. Thirty days of sampling in 2013 and 2014 by boat and backpack electroshocking in LTWC and at stocking sites produced no pure northern sunfish. I compared data from 2005, when 23 northern

sunfish were captured using the same methods, to my 2013 data to investigate changes in the fish community. I found a definite change, mostly due to an overwhelming increased in green sunfish (+941% CPUE), a decrease in sensitive darters and logperch (-91% CPUE) and redhorses (-48% CPUE), and an increase in round goby abundance (+200% CPUE). Multivariate analyses revealed a significant difference in the communities (ANOSIM $R = 0.806$, $P = 0.001$). Several suspected hybrid sunfish were collected and microsatellite DNA analysis confirmed eight bluegill x northern sunfish hybrids, as well as 19 other *Lepomis* hybrids. It is likely that the fish community of LTWC has changed so it can no longer support northern sunfish. ***(Student)***

Title: A comparison of fish communities in southwestern Lake Ontario tributaries from one century ago.
Authors: Ben Carson and Paul Shipman
Affiliation: RIT Thomas H. Gosnell School of Life Sciences

Abstract: Albert Hazen Wright (1879-1970) conducted a survey of fishes and their habitats from 1902 - 1904 in ten Lake Ontario tributaries west of Rochester, NY. These tributaries are located in a region greatly impacted by human activity over the past century, from the construction of the Erie Canal, to the urban sprawl of the city of Rochester. We digitized data from Wright's manuscript, which was re-discovered and posthumously published in Guelph Ichthyology Reviews in 2006, and subjected it to modern statistical analysis. We performed canonical correspondence analysis to identify errors that Wright might have made in his innovative graphical analysis that related fish species with particular habitat types. We also conducted a new survey to see how fish communities have changed in five of these tributaries over the last 100 plus years. Wright's interpretations matched well with our analysis, and with current ecological knowledge for 37 species. We found a total of 37 species, three fewer species overall, and eight new species compared to Wright's previous surveys in these five tributaries. Introductions of native and non-native invasive species, and the habitat parameters river mile, depth, width and vegetation, appeared to have the greatest influence on present day fish distribution. ***(Student)***

Title: Expanded trawl survey enhances understanding of Lake Ontario benthic fishes.
Authors: Rebecca Haehn[1], Brian Weidel[1], Maureen Walsh[1], Michael Connerton[2], Jeremy Holden[3] and Patrick Schulze[1]
Affiliation: [1]USGS, [2]NYSDEC, [3]OMNRF

Abstract: Since 1990's large changes to the Lake Ontario ecosystem, including nutrient reduction, species invasion, and the declines of native benthic invertebrates have resulted in substantial changes in the benthic fish community. Many of these changes were illustrated with observations from a US-based bottom trawl survey that began in the 1970's and targeted Slimy Sculpin. As the ecosystem and fish community changed, observations from this historic spatially-limited survey were insufficient to address questions about invasive Round Goby distributions or the rebounding native Deepwater Sculpin population. In 2015, an expanded survey was conducted that more adequately sampled the available lake habitats. This collaborative survey represented the first whole-lake bottom trawl survey conducted in Lake Ontario since 1972. The survey found increased species richness at the new western and eastern sites, which may have been the result of more diverse habitats in those lake regions. Round Goby and Slimy Sculpin densities and depth distribution were consistent among new and traditionally sampled sites. In contrast, we observed higher than expected Deepwater Sculpin densities at the new deep (>120m) sampling sites. These increased densities resulted in overall lake wide Deepwater Sculpin densities that were greater than estimates based on traditionally sampled sites. ***(Professional)***

Title: An ecological approach to Atlantics restoration in central New York.
Authors: Justin A DiRado, Christopher D Powers, Neil H Ringler and Margaret H Murphy
Affiliation: SUNY ESF Department of Environmental and Forest Biology

Abstract: Reestablishing self-sustaining populations of Atlantic Salmon *Salmo salar* in the Lake Ontario watershed has historically produced limited regional results. In the current study, strain suitability, tributary habitat, and migration barriers were assessed to determine the feasibility of restoring the species in central New York. Salmon fry of Sebago Lake and Lake Memphremagog (Magog) strains were stocked in tributaries of Oneida Lake and the Lake Ontario Drumlins region in 2014 and 2015 to evaluate survival and growth. Abiotic tributary habitat, and hydrologic and geomorphic characteristics of man-made structures were evaluated to determine the suitability of current rearing conditions and adult salmon migration potential. From early-June to late-August, Sebago strain survival ranged from 0-27% and 1-49% in 2014 and 2015, respectively, while Magog survival ranged from 0-22% and 0-38%. Magog strain juveniles expressed significantly higher growth, although results were not universal across all tributaries. Habitat in the Oneida Lake tributaries was more suitable than the Drumlins; however, significantly reduced tributary access in Oneida Lake tributaries would likely limit adult returns to spawning and nursery habitat, and prevent establishment of a wild population. These results suggest that Magog strain salmon, when available, and the Drumlins region should be considered for future restoration efforts. ***(Student)***

Title: Evidence of lake trout recruitment in Lake Champlain: is this the beginning?
Authors: J Ellen Marsden, Carrie Kozel, Bethany Alger and Levi Brown
Affiliation: University of Vermont

Abstract: Lake trout disappeared from Lake Champlain by 1900, and are currently the focus of intensive efforts to restore a self-sustaining population. Stocking of yearling lake trout since 1972 has re-established adult populations, spawning occurs at multiple sites lake-wide, and fry production at several sites is very high. However, little to no recruitment has occurred, as evidenced by the absence of unclipped adults in fall assessments; no regular sampling for juveniles is conducted. In 2015 we conducted two days of focused sampling for juvenile lake trout at one site in the Main Lake basin. We collected 280 lake trout less than 300 mm total length, of which 28% were unclipped. Based on length distribution, these wild fish appear to comprise at least three age classes (young-of-year, age-1, and age-2). The absence of older unclipped fish indicates that recruitment of wild fish began recently. Wild fish were substantially smaller than the hatchery cohorts of the same year class. Diet of larger (145-384 mm TL) wild and hatchery juveniles consisted primarily of rainbow smelt, sculpins, and *Mysis*; diet analysis of smaller individuals is underway. Collection of these early life stages is the first step toward understanding factors that may be affecting recruitment. ***(Professional)***

CONTRIBUTED – SESSION 3

Title: Assessing risk and preventative measures for aquatic invasive species in Brant Lake.
Authors: Alejandro Reyes
Affiliation: SUNY Oneonta

Abstract: Preventing the establishment of aquatic invasive species (AIS) is a primary management concern for many lake associations due to potential ecological and economic impacts. Brant Lake, located in Warren County, NY is one such lake addressing this issue. The 545 hectare waterbody is in close proximity to Lake George and Lake Champlain, both which experience high boat traffic and host invasive species not yet present in Brant Lake. These two large waterbodies lie along Interstate 87, a major corridor that also links Saratoga and Great Sacandaga lakes, Mohawk and Hudson rivers. These linkages create an interconnected network through which invasive species could be transported. Understanding current distributions of potential invaders and risk of establishment are two critical factors that can lead to effective, proactive management of AIS. We identified AIS in closest geographic proximity to Brant Lake

using current species distributions from public information repositories to assess risk of invasion by a number of species. Additionally, we used data from limnological monitoring to understand the ability of those species to establish viable populations within Brant Lake. Finally, we discuss how these data can be used to provide tools to lake stewards at public launch facilities for preventing AIS introductions. ***(Student)***

Title: Is potassium chloride better than sodium chloride for preventing the spread of the zebra mussel?
Authors: Eric A Davis[1], David Wong, PhD and Willard Harman, PhD
Affiliation: [1]SUNY Oneonta Department of Biology, [2]Massachusetts DEP, [3]SUNY Oneonta Biological Field Station

Abstract: The use of chemicals to disinfect watercraft and equipment after exposure to zebra mussels is one decontamination method that is suggested by numerous government agencies in the United States. The ideal decontamination chemical would be easy to handle, easy to obtain, have limited non-target effects, be inexpensive, and relatively friendly to the environment. Potassium chloride and sodium chloride are two chemicals that have been tested separately in previous studies. The toxicity of both chemicals to adult mussels and veliger larvae was examined and compared in the current study. While both chemicals were effective at causing mortality within the study periods, potassium chloride was more effective than sodium chloride. Adult mussels experienced 100% mortality four times faster in potassium chloride than in sodium chloride at 30000mg/L and eight times faster at 10000mg/L. Complete mortality was reached in 12h at 1250mg/L by veligers in potassium chloride compared to 18h at 10000mg/L in sodium chloride. To determine if potassium chloride is better, the cost and availability needs to be considered in addition to the circumstances of what needs to be decontaminated. ***(Student)***

Title: Die-offs of Atlantic menhaden *Brevoortia tyrannus.*
Authors: RG Getchell[1], KL Sams[1], R Smolowitz[2], PR Bowser[1], and H Marquis[1]
Affiliation: [1]Aquatic Animal Health Program, Department of Microbiology and Immunology, College of Veterinary Medicine, Cornell University, [2] Aquatic Diagnostic Laboratory, Roger Williams University

Abstract: Only when large mortality events in coastal waters occur do members of the fishing industry and the public ask municipal, state, and/or federal authorities to pursue potential causes. This was the case for the authors of this presentation in 2015. Die-offs of Atlantic menhaden *Brevoortia tyrannus* in the states of New Jersey, New York, Connecticut, and Rhode Island led to field investigations searching for potential causes, including anoxia, algal blooms, and a viral infection called "spinning disease." Viral isolation was performed with CHSE, EPC, KF1, FHM and BF-2 cell lines. Filtered homogenates were prepared from pooled tissues (kidney, spleen, heart) or from the brain. These tissue homogenates were used to inoculate cells. Cytopathic effects were observed in BF-2 (see photo), KF1, and CHSE cells inoculated with the filtered homogenate from pooled tissues, but not from the brain. Viral infection is still a likely cause of these die-offs, though it is complicated by predator induced anoxia and algal blooms that have been reported anecdotally. Other factors, such as fish density and water temperature, could have played a role in the die-offs, as well. Further research is needed to confirm the identity of this viral isolate and clarify the underlying mechanisms of menhaden mortality events and their effects on menhaden population status. ***(Professional)***

Title: Early mortality syndrome affects Lake Ontario steelhead trout.
Authors: Matt Futia, Sage Hallenbeck and Jacques Rinchard
Affiliation: SUNY Brockport

Abstract: In fall 2014, some steelhead trout returning to the Salmon River, New York were found to be distressed with abnormal swimming behavior. Some unusual mortality cases were also reported by fishermen. Distressed individuals showed low levels of thiamine in their muscle and liver. As a result, NYSDEC personnel from the Salmon River Fish Hatchery injected some adult fish with thiamine (50

mg/kg) to improve their health conditions and ensure successful egg production. In spring 2015, we collected eggs from adults treated or not with thiamine at the Salmon River Fish Hatchery to evaluate their thiamine concentration. In addition, some eggs were fertilized and treated or not with thiamine (2000 ppm). Eggs were then incubated and mortality was assessed until first-feeding. Egg thiamine was measured using high performance liquid chromatography. During this presentation, we will discuss the prevalence and severity of early mortality syndrome in Lake Ontario steelhead trout, the effectiveness of thiamine treatments both in adults and eggs as well as the relationships between thiamine levels and alevin survival. ***(Student)***

Title: Age and size as predictors of mercury accumulation in lake trout from the Finger Lakes.
Authors: Alex Gatch[1], Roxanne Razavi[1], Lisa Cleckner[1], Meghan Brown[1] and Bruce Gilman[2]
Affiliation: [1]Hobart & William Smith College Finger Lakes Institute, [2]Finger Lakes Community College

Abstract: Mercury accumulation by fish is variable by species, individuals, and habitat type. Lake Trout (*Salvelinus namaycush*) are a common sport fish of the Finger Lakes region in New York, so it is important to quantify their mercury (Hg) concentrations to understand potential health risks associated with ingesting the fish by humans and wildlife. Here, I present Lake Trout characteristics (i.e., weight length, age, sex, origin) that are most correlated with fish Hg concentrations so that anglers can make informed decisions regarding which fish to eat. I also present Lake Trout Hg concentrations among and within different Finger Lakes, including Canandaigua (n=8), Cayuga (n=10), Owasco (n=9), and Seneca Lakes (n=17). Fish were collected with gill nets and rod and reel, and then weighed, measured, and sexed. Total Hg concentrations were determined using a Milestone DMA-80 via atomic absorption spectrophotometry. Lake Trout otoliths were used to age fish. Preliminary results from Canandaigua Lake support that neither weight nor length is an accurate predictor of Hg concentrations in Lake Trout, as Hg concentrations were found to be variable among similarly sized fish. ***(Student)***

Title: Variability in and robust estimates of acoustic relationships in *Mysis diluviana.*
Authors: Toby Holda[1], Lars Rudstam[1], David Warner[2], Kathy Leisti[3], Jeremy Holden[4], Maureen Walsh[2] and Michael Connerton[5]
Affiliation: [1]Cornell University, [2]USGS, [3]DFO-MPO, [4]OMNR, [5]NYSDEC

Abstract: The opossum shrimp, *Mysis diluviana* (Audzijonyte), is an important species in the Laurentian Great Lakes and their basins. *M. diluviana* are now often sampled with fisheries acoustics, a powerful tool for gathering extensive and spatially-rich data. To convert this acoustic data to mysid density and biomass, one needs information on the target strength (TS) of mysids. Uncertainty in TS is likely be the largest contributor to uncertainty in acoustic estimates of mysid abundance. Although several studies have estimated TS values for mysids using combinations of theoretical models and field data, inter-annual and inter-lake variability have not been investigated. We combine new field data and published data to assess degree and sources of variability in TS across the Laurentian Great Lakes with special attention to effect of mysid size, depth distribution and inter-lake differences. We also compare our results to Stanton and Chu's theoretical scattering model for a bent fluid cylinder. ***(Student)***

Title: Spatial and temporal variability in acoustic backscatter from fish and zooplankton in the Hudson River estuary from August 2013 to October 2015.
Authors: Maija Niemisto and Joseph D Warren
Affiliation: Stony Brook University School of Marine and Atmospheric Sciences

Abstract: Acoustic surveys are a non-invasive method of measuring the distribution and abundance of biological scatterers in the water column at very high spatial (centimeters vertically, meters horizontally) and temporal (seconds to minutes) resolution. A hull-mounted, single-beam, dual- frequency (38 and 200 kHz) fisheries echosounder was installed aboard the Hudson River Sloop *Clearwater* from 2013-2015 for the purpose of monitoring fish and zooplankton abundance and distribution throughout the Hudson River

Estuary (HRE). With near-daily (from April through October) sampling over the course of a 2.5 year period and covering the entire length of the estuary (from New York City to Albany), the data from this project provides a unique insight into the spatial and temporal variability in the pelagic ecosystem of the HRE. Additional data sets (including onboard trawls and environmental conditions) provide information on the specific organisms which are detected acoustically as well as how the fish and zooplankton of the HRE vary seasonally, annually, latitudinally and with other factors. ***(Student)***

Title: Evaluating closed mark-recapture model assumptions in a lacustrine brook trout population.
Authors: Benjamin Marcy-Quay and Cliff Kraft
Affiliation: Cornell University

Abstract: Mark-recapture models have great utility in fisheries research for their ability to estimate parameters such as population size, survival, recruitment, and emigration. These models are often classified as either "closed," that is based on data from a period where no significant losses or gains to the population are assumed, or "open." Some models, such as Pollock's Robust Design, rely on a combination of closed and open periods to simultaneously estimate multiple parameters. The validity of these closure assumptions is vital to the accuracy of the resulting estimates but they are often made on the basis of what seems "reasonable" without conducting more critical analyses. In this study we examine a dataset of 612 PIT tagged brook trout (*Salvelinus fontinalis*) from a four-occasion sequential mark-recapture study using Oneida-style trap nets in a large, isolated Adirondack lake. We identify several patterns that suggest possible violations to closure assumptions, discuss the spatial processes that may underlie them, and point to new modeling approaches that have the potential to incorporate and control for these complexities. ***(Student)***

Title: Can scale morphometrics estimate the proportion of wild Chinook salmon in historic Lake Ontario catches?
Authors: Patrick Schulze[1], Brian Weidel[1] and Michael Connerton[2]
Affiliation: [1]USGS, [2]NYSDEC

Abstract: The Lake Ontario Chinook Salmon, *Oncorynchus tshawytscha*, fishery is one of the most valuable in the Great Lake basin. Recent mass marking of Chinook Salmon found that the fishery is sustained by both stocked and wild fish. An average of 50% of Age-3 Chinook salmon were wild (range: 34-71%, 2008-11 year classes), but it is unknown whether current proportions reflect historic conditions. Quantifying the proportion of naturally-reproduced Chinook Salmon is critical for parameterizing Chinook Salmon population models, guiding fisheries management, and understanding Lake Ontario food web dynamics. Fish scale accretion is proportional to fish growth, such that growth differences between hatchery and natural environments are reflected in scale morphometrics. Scale morphometrics were used to differentiate Lake Ontario Chinook Salmon origin in a previous study which estimated that an average 62% of Age-3 harvested Chinook were wild (range: 18-74%, 1989 – 2002 year classes). The advent of known-origin Chinook Salmon from mass marking studies provided an opportunity to retest historic origin-discrimination rules. Scale measurements from known-origin Chinook Salmon (age-2, year class = 2010) suggested the previous origin-discrimination rules may have overestimated the proportion of wild fish in the harvest. This bias may have been the result of using known stocked fish with elevated growth rates (pen-reared and broodstock fish) to represent all stocked fish. Moreover, prior to high-accuracy mass marking technology, known wild-origin adult fish were not available to the previous study to calibrate discrimination rules. Based on new origin-discrimination rules, the proportions of wild Chinook salmon in Age-2 catches from 1992 to 2005 were 20-50% of the total harvest. ***(Professional)***

POSTERS

Title: Seasonal habitat use of juvenile Atlantic salmon and steelhead in two eastern Lake Ontario tributaries.
Authors: Ross Abbett, James H Johnson and Marc A Chalupnicki
Affiliation: USGS

Abstract: Atlantic salmon (*Salmo salar*) were extirpated from Lake Ontario in 1898. Currently, there is a binational effort examining the feasibility of restoring Atlantic salmon in Lake Ontario. Juvenile Pacific salmonids, including steelhead (*Oncorhynchus mykiss*) are now naturalized in several Lake Ontario tributaries. Understanding how juvenile Atlantic salmon use stream habitat in sympatry with juvenile Pacific salmonids is important to this effort. We examined seasonal habitat use of juvenile (0+) Atlantic salmon and steelhead (0+, 1+) in Little Sandy Creek and Orwell Brook, two high quality salmonid nursery streams located in Oswego County, NY. We found interspecific, intraspecific, and seasonal variation in habitat use. Subyearling Atlantic salmon were associated with faster water velocities than juvenile steelhead, while juvenile steelhead preferred deeper slower waters, commensurate with age, with yearlings occupying the deepest areas in streams. Yearling steelhead exhibited the greatest degree of habitat selection followed by subyearling Atlantic salmon and steelhead. All of the groups selected habitat with more cover than was available. These findings are consistent with previous findings on the ecology of these two juvenile salmonid species. ***(Professional)***

Title: Atlantic salmon reintroductions: the Lake Champlain experience.
Authors: William Ardren and Zachary Eisenhauer
Affiliation: USFWS Lake Champlain Fisheries Conservation Office

Abstract: Atlantic salmon have been extirpated from over 90% of their historic range in the United States, including all freshwater populations in Lake Ontario and Lake Champlain. Reintroduction programs have been underway for decades; unfortunately none of these programs have resulted in self-sustaining populations. Habitat restoration and sea lamprey control in Lake Ontario and Lake Champlain have reduced limiting factors for reintroductions providing new opportunities for restoring populations. In 2010, we initiated a long-term adaptive management experiment focused on restoring natural populations in Lake Champlain using an inter-dispensary approach. Projects are currently focused on opportunities to improve return rates of adults to focal rivers by characterizing homing and imprinting cues and identifying physiological indicators of smoltification. Preliminary results from these projects have guided alternative hatchery rearing experiments that have resulted in up to a fourfold increase in adult return rate. Now that spawning runs of salmon have been established, we are quantifying impact of thiamine deficiency (caused by eating non-native alewife) on migration and reproductive performance. Downstream passage of smolts through three main stem dams in the Winooski River as well as response to a main stem dam removal in the Boquet River are also being evaluated. ***(Professional)***

Title: The ecology of the flood pulse along a lateral gradient: effects of perturbations on nutrient concentrations, lower trophic levels, and larval esocid performance.
Authors: Ericka Augustyn and John M. Farrell
Affiliation: SUNY ESF Thousand Islands Biological Station

Abstract: Flood pulses saturate riparian zones allowing nutrients and biota to enter nearshore areas and can trigger a cascade of aquatic productivity. Water level stabilization subdues extreme low and high water levels and represses flood pulses therefore restricting interactions between water and fertile flood plains and altering lateral connectivity. In the St. Lawrence River, stabilization of water levels has promoted the establishment and growth of invasive emergent species like *Typha angustifolia* and *T.* x *glauca*. These species are effective at outcompeting native emergent species and filling in nearshore areas, blocking off important spawning and nursery habitats for native northern pike (*Esox lucius*) and

muskellunge (*Esox masquinongy*). Declines in St. Lawrence River northern pike and muskellunge are attributed to poor larval performance caused by reduced spawning and nursery areas. This study will investigate the ecology of the flood pulse along a lateral gradient from drowned river mouth to channel, focusing on nutrient concentrations, lower trophic levels, and larval esocid performance. This study also aims to characterize drowned river mouth and bay nursery habitats in the St. Lawrence River using a suite of morphometric, chemical, and biological attributes in order to understand which variables are most important to larval esocid performance. ***(Student)***

Title: What makes roads accessible, makes streams inaccessible; the effects of road-stream crossings on aquatic connectivity of eastern trout species within the Housatonic River watershed.
Authors: Cole G Baldino
Affiliation: SUNY ESF

Abstract: The Housatonic River watershed, which spans Connecticut, Massachusetts, and Southeastern New York, has for years been known for its abundant and healthy population of brown trout, brook trout, and rainbow trout. These subspecies of the family *Salmonidae* are vital indicators of water quality as they require waters with high levels of dissolved oxygen, cool temperatures (10^{o}-20^{o}C), and a great diversity of food and habitat throughout the watershed. Due to the nature of the upper Housatonic River located in Litchfield County, Connecticut, water levels drop dramatically during summer months, creating a temperature increase unsuitable for trout, forcing them to move into the river's tributaries for thermal refuge. Trout also use these tributaries during the fall to spawn in the optimal conditions of well oxygenated waters, many of with extensive gravel beds. Trout must have full and unimpeded access to these grounds throughout all times of the year, as they are a species very sensitive to varying conditions. Today this is not the case as many road/stream crossings impede trout and other aquatic species passage. All road/stream crossings within five priority watersheds of the upper Housatonic's tributaries were assessed based on factors that could impede aquatic connectivity and reduce flood resilience of the structure. With this information, a GIS model was performed and quality assessment plans were developed for a number of crossings for upgrade or retrofitting. In particular, Furnace Brook possesses a large box culvert immediately upstream of its confluence with the Housatonic River, impeding fish passage since it was constructed in 1995. As a result a recent fish way was constructed and retrofitted in 2014 under the Stream Simulation Design (SSD) protocol. This fish way was monitored in order to assess the level of aquatic connectivity the tributary has due to the recent SSD upgrade. ***(Student)***

Title: An assessment of phosphorus sources & sinks in the West Branch of the Tioughnioga River watershed.
Authors: Jordan Bodway
Affiliation: SUNY ESF

Abstract: Phosphorus is a key controlling nutrient in freshwater systems. Primarily altered by the metabolism of organisms, phosphorus is a dynamic ion that is often either limiting or in excess within aquatic environments. In order to assess phosphorus concentrations in the West Branch of the Tioughnioga River watershed, waters samples were collected in 12 locations spanning approximately 9 miles in length and frozen for further analysis of total phosphorus and total dissolved phosphorus. Sampling occurred after a dry period and after a period of rain in order to assess what effects storm events have on P concentrations. Using standard methods (Wetzel & Likens 2000), all forms of P were converted to orthophosphates and analyzed using a spectrophotometer. Total P & TDP concentrations increased across all sites as a result of the precipitation event. Decreases in P concentrations between inlet and outlet provided evidence for Tully Lake being a major P sink. In addition, Upper & Lower Little York lakes acted as P sources during the dry period and as P sinks during the wet period. This investigation will serve as a baseline study for further analysis of the West Branch of the Tioughnioga River watershed. ***(Student)***

Title: The restoration of lake whitefish as an integral component of the cold-water fish community in Otsego Lake, NY.
Authors: Kevin C Thomas[1], Samantha Carey[1], Brent C Lehman[1], John R Foster[1], D Cornwell[1], Scott Wells[2] and Daniel S Stich[3]
Affiliation: [1]SUNY Cobleskill, [2]NYSDEC Stamford, [3]SUNY Oneonta

Abstract: Lake Whitefish (LWF), a key component of the cold-water fish fauna of Otsego Lake was decimated by the introduction of alewives in the 1980's. With the recent collapse of the alewife population the restoration of the historically important LWF population is now feasible. A collaborative effort to enhance LWF in Otsego Lake is now underway, involving the State University of New York (SUNY) at Cobleskill, New York State Department of Environmental Conservation, and the SUNY Oneonta Biological Field Station. Project objectives are to 1) document LWF spawning locations and population dynamics and 2) supplement the population through field spawning, egg rearing and stocking of fry and fingerlings. Electrofishing, trap netting and fry emergence traps identified three spawning locations in the lake. Eighteen captured ripe whitefish were 6-13 years old, 521-629 mm long and weighed 1.7-2.9 kg. Field spawning of 3 females and 10 males on 9-10 Dec. produced 71,176 eggs for rearing at the Endangered Fish Hatchery at SUNY Cobleskill. The fertilization rate was 80%, eye-up rate was 60% and the hatch rate was 35%. The 6,000 LWF produced will restore an important Otsego Lake fishery and balance the lake's cold-water ecology by enhancing the lake trout forage base. ***(Student)***

Title: Is lake trout recruitment impacted by zebra mussels in Otsego Lake, NY ?
Authors: J. Benjamin Casscles, John R Foster, David M Lucykanish and Nick M Sawick
Affiliation: SUNY Cobleskill

Abstract: Zebra mussels (*Dreissena polymorpha*) became established in Otsego Lake in 2008 and by 2010 carpeted the Lake Trout (*Salvelinus namaycush*) spawning shoal at Bissel Point. The literature suggests that the presence of zebra mussels would negatively impact lake trout recruitment, because of reduced attractiveness of the substrate and the degradation of interstitial water quality within the substrate. In this study current lake trout recruitment was examined and compared to recruitment levels observed in 2003-2004 before the zebra mussel invasion. Emergent fry traps were used to capture lake trout fry swimming up from the substrate at the Bissel Point in April-May 2013 - 2015. Twelve emergent fry traps with a diameter of 81 cm (area=0.52 m^2) were set on four linear transects in depths of 30, 60 and 90 cm, across the entire shoal. Fry recruitment between years was variable. Both the highest (4.83 m^2/day) and lowest (1.59 fry/m^2/day) recruitment levels occurred in the presence of zebra mussels. Fry recruitment was 3.44-3.96 fry/m^2/day in the absence of zebra mussels. Therefore, contrary to expectations from the literature, lake trout fry recruitment in the presence of zebra mussels did not differ significantly from recruitment levels in the absence of zebra mussels. ***(Student)***

Title: Largemouth bass telemetry on the tidal Hudson River.
Authors: Ryan Coulter, Indie Bach and Amanda Tong
Affiliation: NYSDEC

Abstract: Largemouth Bass are an important sportfish in the freshwater tidal Hudson River. Recent data shows a decline in the population. This telemetry study is helping to identify spawning areas, habitat preference and seasonal distributions. From 2013 – 2015, 68 Largemouth Bass >15" were collected and surgically implanted with radio transmitters. Searches for tagged bass were conducted weekly from April – November. Our results to date indicate that 72% of the tagged bass used creek mouths during the spawning period. This is markedly different than a study conducted in the late 1980's where only 33% of radiotagged Largemouth Bass used creek mouths during this same time period. During the summer months the majority of tagged Largemouth Bass were found using main river Water Chestnut *Trapa natans* beds as their primary habitat. Tagged Largemouth Bass start to make a migration to over-wintering areas in early fall, this movement seems to correspond with the annual die off of Water Chestnut beds. The average distance tagged bass traveled from release locations was 3.18 miles.

Tracking of the remaining bass with functioning transmitters will continue through June 2016. ***(Professional)***

Title: Radio telemetry tagging with surgical implant techniques – could you be a fish surgeon?
Authors: Ryan Coulter, Amanda Tong and Indie Bach
Affiliation: NYSDEC

Abstract: Surgically implanted radio transmitters have been used for fisheries studies with varied success. The NYS DEC Region 3 Fisheries Unit had a high success rate performing on-vessel fish surgeries. From 2013-2015, 68 Largemouth Bass and 41 Walleye were collected via boat electrofishing from the tidal Hudson River. Collections occurred in April-May with water temperatures ranging from 39 – 64°F. Fish were anaesthetized using Aqui-20SE (25mL Aqui-20SE/15gal. water). After fish were fully anaesthetized, they were placed in a holding cradle for surgery while a continuous flow of Aqui-20SE solution was run through their gills. Transmitters were implanted after making two incisions and using a metal cannular to thread the antennae through the body cavity. Simple interrupted sutures were made and Vetbond was placed over the incisions. Fish were then placed in a recovery tank and held until visibly recovered. Fish were under anesthesia for an average of 15 minutes and average surgery length was 9 minutes. Overall success rate was 94% based on known mortality within 30 days of release. ***(Professional)***

Title: Effects of waste water treatment plant inputs on water quality and macroinvertebrate assemblages along the Chenango River, NY.
Authors: Austin Demarest, Nicole Madden and Elizabeth Stieber
Affiliation: SUNY ESF

Abstract: Aquatic macroinvertebrates are indicators of water quality because of their tolerance of environmental stressors. Waste water treatment plants (WWTPs) often have outflows that are put directly into rivers. Three WWTPs within the Chenango River in the Villages of Greene, Oxford, and Norwich were chosen for this assessment. EPT, HBI, PMA, family richness, family diversity, total suspended solids, and phosphorus tests were used to evaluate the level of impact on water quality and assemblages of macroinvertebrates. Site 1 downstream had the highest family richness, EPT, PMA, family diversity, and dissolved oxygen so it was determined to be the reach with the highest water quality. Site 3 downstream had the lowest family richness, highest HBI, highest TSS, highest unfiltered P concentration, and was a moderate impact site so it was determined to be the reach with the lowest water quality. No trends were determined between the physical, chemical, and biological parameters. A K-S test was used but revealed no significant values. With a sample size of three it is difficult to draw accurate conclusions so this project is considered to be a pilot study. ***(Student)***

Title: The diel diet of subyearling pumpkinseed in a Lake Ontario embayment.
Authors: Avriel R. Diaz, James H. Johnson and Marc A. Chalupnicki
Affiliation: USGS Tunison Laboratory of Aquatic Science

The diel foraging behavior of subyearling Pumpkinseed (Lepomis gibbosus) is poorly understood. We examined the 24 hour feeding strategy of subyearling Pumpkinseed in Sterling Pond an embayment of Lake Ontario in Fair Haven, New York. Pumpkinseed feeding intensity was highest during crepuscular periods (0800h and 2000h) periods. Amphipods followed by chironomids were the two major prey taxa consumed for all time periods. Diet composition consisted of eight or more taxa for all time periods except 0800h, where Pumpkinseed consumed only three types of taxa (amphipods, chrionomids and copepods). Overall, the 24 hour diet of Pumpkinseed consisted mainly of amphipods (41%) and chironomids (35%). Diet overlap was most prominent between 0800h and 1200h time periods and least prominent between 1600h and 2400h periods. We observed a distinct diel pattern in food consumption of

Pumpkinseed during crepuscular periods which may be due to either predator avoidance or prey availability. ***(Professional)***

Title: Retention of visible implant elastomer and calcein marks in juvenile lake sturgeon.
Authors: PL Randall, DE Dittman and MA Chalupnicki
Affiliation: USGS Great Lakes Science Center Tunison Laboratory of Aquatic Science

Abstract: Lake Sturgeon (*Acipenser fulvescens*), like many sturgeon species, is threatened. One critical technical gap in the support of rehabilitation of sturgeon populations is evaluation of mark application and retention for field identification of stocked fish. We tested 2 fluorescent methods, visible implant elastomer (VIE), and the chemical SE MARK (calcein) on cultured young-of-year (YOY) sturgeon. The external VIE marks were implanted in the skin of the ventral snout surface. Sturgeon were calcein marked in a 3 stage immersion: salt, calcein, and freshwater baths, binding to body calcium. We evaluated mark retention in the laboratory for 12 months. In the first month, 10% of VIE tagged sturgeon lost tags. After 9 months, only 67% of fish retained tags, with 47% of these marks degraded. Retention and degradation rates did not change for the remaining 3 months. Population and recruitment studies will need to factor in this rate of tag loss and degradation for the interpretation of field data in discrimination of stocked and wild juveniles. All of the calcein marked fish retained the mark in their fin rays and scutes, with no degradation observed. Thus, calcein is suitable for marking YOY Lake Sturgeon for at least 12 months of field identification. ***(Professional)***

Title: Evaluating handling and tagging effects, in-river residence time, and post-spawn migration of anadromous river herring in the Hudson River, New York.
Author: Wes Eakin
Affiliation: Cornell University

Abstract: In a 2013 pilot study, acoustic tags were inserted into two species of river herring, alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*). The primary objectives were to identify handling/tagging effects and assess gross in-river movement and residence time. The secondary objective was to identify post-spawn coastal migration patterns. Fish were collected during our annual fisheries independent sampling survey in the upper portion of the Hudson River, NY. Vemco® V7 acoustic transmitters were gastrically inserted into 25 river herring (13 alewives and 12 blueback herring). Despite the small sample size, in-river acoustic data were collected from 23 of the 25 river herring. The majority of tagged fish exhibited some level of fallback after the tagging event with all but female alewives returning to spawning areas. The latter may be a result of tagging location and timing, as the majority of female alewives were tagged on the spawning grounds and were either in or near spawning condition. Both species of river herring experienced similar in-river residence times of approximately two to three weeks and exited the system three to six days post-spawn. Remarkably, data were collected on coastal movements of four blueback herring (two females and two males). All coastal receiver data came from locations spanning the south shore of Long Island, NY to the mouth of Penobscot Bay, ME. Results of this pilot study provide the confidence to repeat this experiment on a larger scale with multi-year tags. This could identify unknown in-river spawning areas, provide information regarding spawning site fidelity and bolster current knowledge of coastal migration patterns for both species. ***(Professional)***

Title: Master of science in lake management.
Authors: Luke J. Gervase
Affiliation: SUNY Oneonta

Abstract: The complexities of environmental and societal factors that impact lake systems are driving lake associations and municipalities to seek professional management of vital aquatic resources. In

response to this demand the Biology Department at SUNY Oneonta is now offering a Master of Science degree in Lake Management. Degree recipients meet the requirements to apply for certification as Lake Managers (CLMs) by the North American Lake Management Society (NALMS). Practically all programmatic work takes place at the SUNY Oneonta Biological Field Station (BFS) in Cooperstown. Most students receive financial support totaling at least $7,500 annually. In order to graduate with a Master of Science degree, students must complete 32 credit hours, successfully complete thesis research, and complete an oral comprehensive exam and thesis defense. ***(Student)***

Title: Effects of St. Lawrence Seaway shipping on Lepomis habitat use.
Authors: Kaitlin S Hanak and James E McKenna
Affiliation: USGS Tunison Laboratory of Aquatic Science

Abstract: Panfish are an integral part of the St. Lawrence River fishery, but these nest-building species may be adversely affected by commercial shipping traffic. It is hypothesized that *Lepomis* avoid habitat near shipping channels due to wave action being detrimental to nesting success. St. Lawrence River fish sampling data were examined to determine if a relationship existed between traffic in the shipping channel and *Lepomis* spp. population density. Roughly 250 beach seining sites were evaluated based on the presence of Pumpkinseed (*Lepomis gibbosus*) and/or Bluegill (*Lepomis macrochirus*). All sites were within the main stem of the St. Lawrence River, between 0 and 1.5m in depth, and were sampled using a 30' beach seine between June and September. Sites were grouped into categories based on distance and exposure to the shipping channel. An analysis of variance examined the differences in *Lepomis* populations between categories. Future studies may be needed to clarify the relationship between large freighters and fish habitat use, both in respect to *Lepomis* and other important gamefish, such as the black basses. ***(Professional)***

Title: Predictive modeling of young of year muskellunge based on habitat selection in the St. Lawrence River watershed.
Authors: Kaitlin S Hanak and James E McKenna
Affiliation: USGS Great Lakes Science Center Tunison Laboratory of Aquatic Science

Abstract: Muskellunge (*Esox masquinongy*) are important gamefish that are dependent on habitats in or near wetlands to complete their life cycle, but characteristics and extent of their nursery habitats are poorly known in tributaries of the St. Lawrence River. Young of year Muskellunge habitat was characterized using environmental data from 614 sites along the St. Lawrence River and its tributaries. Thirty five individual fish at twenty seven sample sites were captured using a 30' beach seine. Patterns in habitat use were observed on both a broad and fine scale. Muskellunge populations were absent or negligible from certain systems, such as the Oswegatchie and English-Salmon watersheds. The Grasse River supported a fairly dense population of young Muskellunge, 23 per Hectare of sampled habitat. Canonical correspondence analysis, followed by t-tests, showed Muskellunge preferred habitat near submerged aquatic vegetation with large amounts of nearby open water and a low watershed gradient ($p<0.05$). Artificial neural networks were created, using broad scale or fine scale habitat variables shown to influence Muskellunge and the fish community within the study watersheds, to provide predictive models. ***(Professional)***

Title: Cisco and bloater calcein retention under various preservatives.
Authors: Tyler R Knapp, Marc Chalupnicki and James H Johnson
Affiliation: USGS Great Lakes Science Center Tunison Laboratory of Aquatic Science

Abstract: The restoration of native fish species into Lake Ontario has given rise to new culture techniques that need to be evaluated. Mass marking of Cisco, *Coregonus artedi,* and Bloater, *Coregonus hoyi* with the chemical SE MARK (calcein) has been underway for two years with successful results. Despite successful marking, calcein retention under various preservatives is unknown. In a hatchery

setting we evaluated calcein retention for both species using four common preservatives: ethanol (92%), 37% formaldehyde, 10% buffered formalin, and culture water (frozen). For both species, ethanol eliminated the calcein mark the fastest, within one month, followed by culture water which retained the mark over a three month observation period. Buffered formalin and formaldehyde retained the mark the longest, four months; however, the quality of the mark was moderate. While these results are encouraging, preserved marked fish captured from the field are still needed for further investigation. ***(Professional)***

Title: Habitat preference for young-of-year gamefish within the St. Lawrence watershed.
Authors: Gregory R Kronisch, Kaitlin S Hanak and James E McKenna, Jr
Affiliation: USGS Great Lakes Science Center Tunison Laboratory of Aquatic Science

Abstract: Knowledge of young-of-year gamefish nursery habitat enhances stock management by helping focus conservation efforts. However, this habitat is not well known in the St. Lawrence tributaries. Fish count data were collected from >600 seine sites on the St. Lawrence River and its tributaries from 2009 to 2015. In addition to species abundance, local habitat data were compiled for these sites, including dissolved oxygen, pH, percent vegetation cover, and turbidity. These data, combined with broad-scale records, were used to determine young-of-year gamefish habitat preferences for northern New York State. Canonical correspondence analysis was used to identify the habitat variables most important for young-of-year fish, while cluster analyses were conducted to group habitat and fish samples. The results indicate that young-of-year fish habitat in St. Lawrence River tributaries can be characterized by a relatively small number of condition factors, allowing us to map and quantify the extent of those important habitats. The resulting habitat preferences and locations may support fisheries management within the St. Lawrence River and its tributaries. ***(Professional)***

Title: Enough fish food in Lake Ontario? Insights from a 2013 food web model.
Authors: Alex Looi[1], Brian Weidel[1], Matt Paufve[2], Curt Karboski[3], Brian O'Malley[4], Toby Holda[2], Jeremy Holden[5], Maureen Walsh[1], Brian Lantry[1], Kelly Bowen[6], Warren Currie[6], James Waktins[2], Lars Rudstam[2]
Affiliation: [1]USGS, [2]Cornell University, [3]USFWS, [4]University of Vermont, [5]OMNRF, [6]Environment Canada

Abstract: Human impacts such as introduced species and nutrient reductions are believed to have caused substantial changes in the Lake Ontario food web; however these impacts have been poorly quantified. We used data from a collaborative, whole-lake research effort in 2013 to parameterize a mass-balance food web model (Ecopath) of Lake Ontario. Here we describe the current state, explore management scenarios, and contrast Lake Ontario with the other Great Lakes including itself temporally. Here we focus on the status of zooplankton and benthic invertebrates (fish food) of Lake Ontario, two functional groups that link fish to primary production and detritus we make predictions on how reduced nutrient input from Lake Erie, resulting from Clean Water Act Legislation, could drive primary production and invertebrates and thus potentially affect the fish population. We compare our 2013 model inputs to historic Lake Ontario food web models and data from the 1980's, 1990's and 2000's, to illustrate how the food web has changed with time. By understanding the dynamics and interactions of fish food we can then broaden our understanding of fish themselves. ***(Professional)***

Title: Restoring sauger to the Allegheny River watershed.
Authors: Jeff Loukmas, Justin Brewer and Michael Clancy
Affiliation: NYSDEC

Abstract: Sauger are one of the most critically imperiled fish species in New York State and a Conservation Management Plan was recently adopted to aid its recovery. The goal of the plan is to establish and maintain self-sustaining Sauger populations in all suitable waters of native watersheds, including the Allegheny River watershed. A stocking program was implemented to establish a population in this watershed. Sauger fry from the Ohio River, provided by the West Virginia DNR in 2014 and 2015, were raised in ponds at the Chautauqua Hatchery until June and then were stocked in the upper Allegheny Reservoir. Electrified trawl and boat electrofishing surveys were conducted in late summer of each year to check the status of stocked fish. Six YOY Sauger were collected during trawl surveys and 67 YOY and 17 age 1 Sauger were collected during boat electrofishing surveys. The prevalence of a variety of fish species in the trawl surveys suggests that the forage base in the upper reservoir is adequate to support a Sauger population. The stocking program will continue through 2018 and a survey will be conducted throughout the watershed in 2020 to determine if the objective of establishing a self-sustaining population was met. ***(Professional)***

Title: Use of exploitation simulation models for silver carp (*Hypophthalmichthys molitrix*) populations in several midwestern U.S. rivers.
Authors: Seth A Love[1], Justin Seibert[1] and Quinton E Phelps[2]
Affiliation: [1]Southeast Missouri State University, [2]Missouri Department of Conservation

Abstract: Management of silver carp (*Hypophthalmichthys molitrix*) has become a growing concern for multiple state and federal entities, and commercial fishing may have the greatest potential to this invasive species. However, for a management action to be successful, the level of exploitation required to reduce silver carp populations must be quantified. Therefore, silver carp were collected from Midwestern U.S. rivers (i.e., Upper, Middle, and Lower Mississippi, Missouri, Illinois, Ohio, and Wabash rivers) to obtain population dynamics (i.e., recruitment, growth and mortality) information. Parameters obtained from population demographics were used to simulate exploitation levels using a spawning potential ratio (SPR) approach to determine target size and the amount of exploitation needed to recruitment overfish silver carp within each river system. Overall, we determined that silver carp populations (regardless of river) must be exploited at a small size (i.e., 27–33% of population exploited at ≥300 mm or 33–44% exploited at ≥400 mm), in order to reduce SPR to 0.2, which is identified as a threshold for recruitment overfishing. However, an understanding of the impacts of small mesh sizes on native species and an incentive program for commercial fisherman to promote catch of small fish is needed. This study provides federal and state agencies levels of exploitation and a target size required to effectively reduce silver carp populations in multiple rivers. ***(Student)***

Title: Acoustic measurements of the distribution and abundance of Atlantic menhaden (*Brevoortia tyrannus*) in the Peconic River and Estuary in Long Island, NY.
Authors: Brandyn M Lucca and Joseph D Warren
Affiliation: Stony Brook University School of Marine and Atmospheric Sciences

Abstract: Atlantic menhaden (*Brevoortia tyrannus*) is an estuarine-dependent planktivorous fish that is both economically and ecologically important along the entire eastern coast of the United States. Following two very large fish kill events which was estimated at 300,000 dead menhaden in the estuary, we conducted multiple repeat acoustic transect surveys using a fisheries echosounder between June and November 2015 in Flanders Bay and the Peconic River to estimate the abundance and distribution of menhaden in the estuary. Acoustic scatterers were confirmed as being Atlantic menhaden through a variety of means including: individual fish target strength values, visual observations of schools, and photographs of local foraging ospreys. Data collected from each survey were extrapolated to produce abundance and biomass estimates for both Flanders Bay and the Peconic River along with uncertainties. A unique aspect of this study was that the survey was conducted in very shallow water (maximum depth = 3.0 m, average depth = 1.5 m). ***(Student)***

Title: Efficacy and toxicity of chloramine T disinfection of cisco fry.
Authors: Gregg E Mackey[1], Marc A Chalupknicki[1], James H Johnson[1], Neil H Ringler[2] and Deborah D Iwanowicz[1]
Affiliation: [1]USGS Great Lakes Science Center Tunison Laboratory of Aquatic Science, [2]SUNY ESF

Abstract: Restoring native Cisco (*Coregonus artedi*) populations into Lake Ontario is a joint effort by the New York State Department of Environmental Conservation and the U.S. Geological Survey. The restoration of Cisco has given rise to new husbandry techniques and protocols to control bacterial pathogens on hatchery raised fish. We evaluated the toxicity of Chloramine T on Cisco fry, and its effectiveness as a disinfectant of bacterial pathogens on the surface of the gills. Ciscos were exposed to three consecutive daily one hour treatments at 0, 5, 10, 20, 40, 80, or 160mg/L. Survival of fry tended to be similar at concentrations up to 80mg/L and significantly reduced at concentrations of 160mg/L. We calculated the concentrations of Chloramine T that killed 50% of the Cisco fry to be 112 mg/L. Following three consecutive daily one hour treatments of 20mg/L Chloramine T, *Paracoccus sp.* and *Acinetobacter lwoffii* were the predominant species present on gill surfaces and were significantly greater in abundance following the treatment. The use of Chloramine T as a disinfectant on Cisco fry was not effective at controlling gill bacterial presence within acceptable fry toxicity levels. ***(Professional)***

Title: Daces you can count-on and needing attention.
Authors: Eric Maxwell and Doug Carlson
Affiliation: NYSDEC

Abstract: Minnows are an important part of our diversity of stream fishes and are wanting of closer attention so details of their distribution and status can be resolved. Among the most "needy" are the pearl daces, Margariscus found in northern New York and the Finescale Dace, Chrosomus neogaeus. Their proper identification depends on scale counting in the laboratory and eventual museum archival (going into a jar). That's not hard, but it is not commonly practiced. The pearl daces are now recognized as two species, are found in about 3/4ths the watersheds of the state and have specialized habitat requirements. Another of the daces, Finescale Dace also has tiny scales and is hard to distinguish from its congener. For both genera, there are substantial areas of species range overlap in Northern New York and it is confounded by hybridization. Confidence in proper identification requires laboratory and possibly internal examination. Both the Finescale Dace and the Northern Pearl Dace, M. nachtriebi, may have experienced declines in New York, but that is unclear until they become better understood. Counting scales and archiving specimens is necessary. ***(Professional)***

Title: St. Lawrence – Thousand Islands centrarchid panfish trends.
Authors: Russ McCullough and Jessica Goretzke
Affiliation: NYSDEC

Abstract: The St. Lawrence River supports one of the major fisheries in New York State based on data from the NYSDEC Statewide Angler Survey. The River ecosystem has been subjected to many perturbations in recent decades including water level control, nutrient reduction and the establishment of invasive species. This examination of the centrarchid panfish portion of the St. Lawrence Thousand Islands fish community was based on gill-net collections conducted as part of the NYSDEC warmwater fish stock assessment program for the upper St. Lawrence River. Collections were made with anchored sinking gill nets set annually at 32 sites between Clayton and Morristown in 10-60 feet (3-18 m) of water. Abundance, abundance rank, frequency of occurrence and relative weight characteristics of Rock Bass and Pumpkinseed Sunfish populations were examined. Pumpkinseed Sunfish, once among the most abundant species sampled, have declined to the point where they have been almost undetectable in some recent years. They have also declined in condition. At the same time, Rock Bass have substantially increased in abundance, now ranking ahead of yellow perch (most abundant species in 25 of first 27 years surveyed) in more than half of years since 2003. ***(Professional)***

Title: Great Lakes aquatic gap analysis 2016: son of gap.
Authors: James E McKenna, Jr [1], Mike Slattery[1] and Chris Castiglione[2]
Affiliation: [1]USGS Great Lakes Science Center Tunison Laboratory of Aquatic Science, [2]SUNY ESF

Abstract: Great Lakes Regional Aquatic Gap Analysis (GLGap) is established as a program providing a multitude of data, information, and analysis tools for lotic and open water habitats and their living aquatic denizens, including fish, throughout the Great Lakes Region and all of New York State. Applications have diversified greatly since completion of the habitat database and predictive fish distribution models. Recent examples including, aquatic habitat frameworks and fish-based classifications for all of the Great Lakes watershed (US) and lakes proper, tools to evaluate ecological flows, climate change effects tool, and study of potential hydrofracking effects. The habitat frameworks allow anyone to view and analyze hundreds of habitat variables and fish model predictions for each stream reach or lake unit, or any broader scale up to the whole basin. Ecoflows measures stream tolerance to water diversion, by type, and fish response to those changes. FishVis is the first tool to provide vulnerability measures for streams based on predicted fish responses to climate change. GLGap predictions of Brook Trout habitats can help identify where they would be most vulnerable to hydrofracking. These provide new capabilities to address our complex ecological problems and more are being developed. ***(Professional)***

Title: The lazy Black River walleye.
Authors: James E McKenna, Jr. [1], Marc Chalupnicki[1], Dawn Dittman[1] and Roger Klindt[2]
Affiliation: [1]USGS Great Lakes Science Center Tunison Laboratory of Aquatic Science, [2]NYSDEC

Abstract: Walleye are game fish that historically supported commercial fisheries and still support an important sport fishery in Lake Ontario. However, production of walleye in eastern Lake Ontario may be limited by available spawning habitat. In the Black River, walleye ascend the river in the spring and, while successful spawning is suspected, it has not been documented. The flashy river and hydropower operation highly modify potential walleye spawning habitat. We monitored egg production and larvae production throughout the river from the Dexter dam to the mouth for three years. We found walleye eggs in several areas each year and captured larval walleye during the past two sampling seasons. The timing and location-specific egg counts show differential use of parts of the river, with the most production early in the season at the lowest habitat area. Migrating upstream is energetically costly and most of the first spawners chose to deposit their eggs at the first available habitat. Enhancing substrate may improve productivity, especially in the lowest habitat. Available reef improvement sites could double high quality habitat in the river. Enhancing this population (and associated species, e.g., lake sturgeon) should increase the ecological coupling between Lake Ontario and the Black River. ***(Professional)***

Title: A review of fecundity and egg size of cisco (*Coregonus artedi*) and comparison with other salmonids in the Laurentian Great Lakes.
Authors: James D McKenna, H George Ketola, Jared Myers, Daniel Yule, Marc Chalupnicki
Affiliation: USGS Great Lakes Science Center Tunison Laboratory of Aquatic Science

Abstract: Understanding fecundity of Great Lakes cisco (*Coregonus artedi Lesueur*) is fundamental to their management. We summarized previously published (1938 – 1964) studies of egg production by cisco from the Great Lakes. Data from these published studies were combined with data we collected (2008 - 2015) from Lakes Superior, Michigan, and Huron to compute fecundity (F) as a power function ($F = a L_t^{b}$) of fish total length (L_t). Best fit cisco fecundity models for Lakes Superior, Michigan, Huron, and Ontario were, $F = 0.1942L_t^{3.1906}$, $F = 0.0154L_t^{3.8983}$, $F = 0.0691L_t^{3.5191}$, and $F = 0.1178L_t^{3.4557}$, respectively, and was $F = 0.0572L_t^{3.5475}$ for all lakes combined. Models were also developed for lake whitefish ($F = 0.002L_t^{4.1287}$), and bloater ($F=0.7332L_t^{2.7982}$). Fecundity of three Great Lakes salmonines (Atlantic salmon, lake trout, and steelhead) was comparable to that of bloaters and round whitefish, but size and maturity were larger. Diameters of eggs of coregonines (1.3 to 3.2 mm) were smaller than those for the three salmonines (4.0 to 6.2 mm) and tended to be inversely correlated to fecundity of the species

we examined. Among the examined salmonids, ciscoes appear to have the highest reproductive potential, making them good candidates for restoration. ***(Professional)***

Title: Fishery survey of the St. Regis River prior to Hogansburg dam removal.
Authors: Emma Mrowka[1] and Anthony David[2]
Affiliation: USGS, St. Regis Mohawk Tribe

Abstract: Removal of the Hogansburg Dam, the first barrier on the St. Regis River, will open potential habitat to migratory fishes, but may cause loss of resident habitat in the impoundment area and downstream of the dam. Fish assemblages above and below the dam may be altered from changes in habitat use and new food web interactions. Fish assemblage data were collected in the St. Regis River from the mouth to approximately 32 km upstream at Brasher Falls and were used to characterize assemblages found above and below the dam. A total of 143 sites were sampled with seine, gillnet, and boat electroshocking, producing a catch of 26,622 fish. Forty three species were found above the dam and 41 were found below. The average diversity above the dam for all gear types was 0.97, and the average diversity below the dam was 1.53. This fish assemblage data collected prior to the removal of the Hogansburg Dam will be used as comparison to data collected during and post removal in order to monitor changes in the fisheries and guide possible restoration efforts. ***(Professional)***

Title: Utilizing skein eggs as an alternative egg source for bloater reintroduction into Lake Ontario.
Authors: KJ Nash[1], MA Chalupnicki[1], JH Johnson[1] and NH Ringler[2]
Affiliation: [1]USGS Great Lakes Science Center Tunison Laboratory of Aquatic Science, [2]SUNY ESF

Abstract: Restoration of native fish populations into Lake Ontario is a multi-agency effort within New York State. Populations of Bloater (*Coregonus hoyi*), a deep water cisco, over the past century have become extirpated in Lake Ontario due to overharvesting and competition of invasive species. The reintroduction of bloater as an alternative forage fish to non-endemic species has given a rise to new culture methods utilizing the availability of current stable populations in Lake Michigan. Specific efforts for new culture techniques have been made for potential utilization of skein-bound eggs to produce viable offspring. Retrieving skein eggs for the purpose of reintroducing Bloater back into Lake Ontario would be beneficial due to the large quantity available. In 2015, we evaluated the growth and survival of spawned ripe and skein-bound Bloater eggs. The egg diameter of skein eggs was significantly smaller than the ripe eggs but did not appear to effect survival or development. Overall, the survival of ripe eggs was slightly higher than skein eggs but was not significantly different. In the first two months post-hatch survival was greater for "skein" fish, with "ripe" fish survival becoming slightly higher by the fall. Implementation by management agencies of skein-bound eggs as an alternative egg source may benefit restoration efforts of bloater into Lake Ontario. ***(Professional)***

Title: Compiling 50 years of data for Lake Ontario: collaborative data management and historical trends.
Authors: MR Paufve[1], LG Rudstam[1], JM Watkins[1] and BC Weidel[2]
Affiliation: [1]Cornell Biological Field Statio, [2]USGS Lake Ontario Biological Station

Abstract: Binational government agencies and educational institutions have produced a wealth of spatially-referenced limnological data for Lake Ontario dating back to the 1960's. These data sets reside in separate locations, are in a variety of incompatible formats and may not be inaccessible to managers and other potential users. A project funded by the Great Lakes Observing System (GLOS) was initiated with the objectives of 1) working with data holders to promote data sharing, 2) coalescing disparate data sets, including water column profiles (temperature, dissolved oxygen, pigment fluorescence and other parameters), zooplankton communities and biomass, and concentrations of chlorophyll and nutrients into consistently formatted databases and 3) making these databases discoverable, accessible, documented and usable. This will enable managers to place observations, including those from the Cooperative Science and Monitoring Initiative (CSMI) intensive field season in 2013, within a historical context and on a lake-

wide scale. Products derived from compiled databases include long-term trends in lake-wide water temperature profiles, thermal stratification and deep chlorophyll layer dynamics and seasonal and spatial distribution of zooplankton communities. ***(Professional)***

Title: Temporal and spatial patterns of juvenile fish abundance in subtidal habitats in the freshwater tidal Hudson River at Germantown, NY.
Authors: Edward Perri, Brent C Lehman and John R Foster
Affiliation: SUNY Cobleskill

Abstract: The tidal freshwater portion of the Hudson River Estuary extends for 145 k from the Troy Dam. It forms a unique ecosystem, distinct from the lower saline estuary. While studies of small estuarine fishes are numerous, very few have focused on subtidal freshwater habitat. This study examines the temporal and spatial patterns of juvenile fish abundance in subtidal freshwater habitats at Germantown N.Y and the role these habitats play as nursery grounds. An electrified benthic trawl was used to sample varying subtidal depths in rocky and sandy habitats. Ten monthly trawl runs were made May-November 2015. Fourteen species were captured with sport fish making up 60% of the catch. Monthly catch fluctuated by species and corresponded with juvenile life stages of migratory and resident fish. White perch (*Morone americana)*, American eel (*Anguilla rostrata*), spottail shiner (*Notropis hudsonius*) had both spring and fall peaks in abundance. Species richness was also highest in June and September. Species diversity was significantly higher at depths greater than 10 feet than at shallower depths. While tidal freshwater habitats are typically sampled with shore seines, this study demonstrates that deeper subtidal waters provide nursery habitat, particularly for striped bass (*Morone saxatilis*), the most abundant species captured. ***(Student)***

Title: Assessing mercury dynamics in aquatic food webs of the Finger Lakes.
Authors: Roxanne Razavi[1], Lisa Cleckner[1], Susan Cushman[1,2], John Halfman[1,3], Alex Gatch[2], Nikki Andrzejczyk[2], John Foust[4] and Bruce Gilman[4]
Affiliation: [1]Finger Lakes Institute, Hobart and William Smith Colleges, [2]Department of Biology, Hobart and William Smith Colleges, [3]Department of Geosciences, Hobart and William Smith Colleges [4]Finger Lakes Community College

Abstract: Mercury (Hg) contamination of New York State fisheries impedes healthy human and wildlife consumption of fish. Specifically, the production of methylmercury (MeHg) in aquatic systems is of concern due to neurotoxic and reproductive effects on humans and wildlife. Concentrations of Hg in fish are a function of many factors, including the bioavailability of MeHg, food web structure, and fish growth rate and condition. In the Finger Lakes region of New York, fisheries play an important role in making the Finger Lakes important regional economic drivers. However, little information is available on Hg biomagnification in the Finger Lakes, and MeHg concentrations are unavailable for organisms at the base of Finger Lakes food webs. This poster describes the NYSERDA funded study initiated at the Finger Lakes Institute at Hobart and William Smith Colleges, in collaboration with the Finger Lakes Community College, to assess bioavailability and biomagnification of Hg in Finger Lakes biota. From May – October 2015, monthly samples were taken of suspended particulate matter, zooplankton, benthos, and forage and game fish in Honeoye, Canandaigua, Seneca, Cayuga, and Owasco Lakes. In addition, tributaries of each lake were sampled for stream fish and macroinvertebrates to assess land use effects on stream Hg concentrations. ***(Professional)***

Title: Population characteristics of bowfin (*Amia calva*) from a Great Lakes coastal wetland, with an investigation of captive breeding and artificial diet.
Authors: David Sanderson-Kilchenstein and James Haynes
Affiliation: SUNY Brockport

Abstract: Bowfin are currently being harvested at high rates in the Mississippi River system for the sale of their roe as a caviar alternative. The goal of this study was to evaluate the potential impacts of—and develop an in-captivity alternative to—commercial harvest of bowfin in the Great Lakes. Pectoral fin ray sections were used to age 51 bowfin from Braddock Bay, Monroe Co., NY, and back-calculated length-at-age data were used to fit the Von Bertalanffy growth model. Theoretical maximum length was estimated to be 753 mm TL, the coefficient of growth 0.262, and time at length zero -0.023 years. These values resemble populations described from the upper Mississippi River that grow slower and live longer than populations in the south, and therefore would be affected more by commercial harvesting. Aquaculture could provide an alternative to wild harvest, but no established protocols exist. I attempted captive breeding and tested the acceptance of two artificial diets. The 55 bowfin did not respond well to captivity: no breeding was observed and most fish lost weight. Low-intensity culture of bowfin may not be possible using the conditions I tested and artificial propagation likely will require induction by hormone injection. ***(Student)***

Title: Walleye growth in relation to alewife abundance in Otsego Lake, New York.
Authors: Nicholas J Sanges, John R Foster, Grant G Brekke and Mark D Cornwell
Affiliation: SUNY Cobleskill

Abstract: Walleyes (*Sander vitreus*) were stocked into Otsego Lake, NY in 2000 to control alewives (*Alosa pseudoharengus*), which had been illegally introduced in 1986. In Otsego Lake, alewives quickly became the primary food of walleyes. Alewife populations underwent massive fluctuations before plummeting to close to zero in recent years. This study was conducted to determine if the fluctuating alewife population density impacted the growth of various life stages and year classes of walleye. A backpack electrofisher was used to collect walleye on their spawning run in tributary streams and a boat electrofisher was used to collect walleye from their staging area in the lake around Sunken Island. From 2008 to present, over 400 walleye were sexed, measured and scales removed for aging. Back calculation of size at age was used to determine growth of various size and year classes and compared to hydroacoustic data on alewife abundance. From the initial stocking, walleye growth in all age classes declined until 2003, then increased for ages 3+ to 6+. Overall, walleye growth was not correlated with alewife abundance, and therefore not hindered by the collapse of the alewife population. ***(Student)***

Title: Pond culture of pugnose shiners (*Notropis anogenus*) is a feasible strategy for restoring extirpated populations in New York's bays of Lake Ontario.
Authors: Michael W Soukup[1], John R Foster[1], Brent C Lehman[1], Doug M Carlson[2] and Scott Schlueter[3]
Affiliation: [1]SUNY Cobleskill, [2]NYSDEC, [3]USFWS

Abstract: This project attempted to demonstrate the feasibility of utilizing pond culture techniques to produce enough pugnose shiners to restore them to their native range and abundance in NYS. Pugnose shiners are endangered in New York because they were rare in the St. Lawrence River and were extirpated from most bays of Lake Ontario and from Cayuga Lake. A recovery program was initiated to restore them to a more eastern bay of Lake Ontario. The brood stock came from Sodus Bay, Lake Ontario because they belong to the last remaining New York "lake" population, which are genetically distinct from the St. Lawrence River population. In April 2015, fish were collected from Sodus Bay, for disease certification. On 24 June 2015, another 65 shiners were captured from Sodus Bay for stocking a 2/3 acre pond at SUNY Cobleskill. In spite of the late stocking date, the pugnose shiners spawned and there were several hundred juveniles in December averaging 41 mm. They grew to nearly the size of the adults stocked 6 months earlier. This project not only demonstrated the feasibility of pond culture of pugnose shiners, but demonstrated its potential for producing thousands of pugnose shiners for fall stocking each year. ***(Student)***

Title: Thiamine deficiency in lake trout eggs from Cayuga Lake.
Authors: J Rinchard, L Stratton and M Futia
Affiliation: SUNY Brockport Department of Environmental Science and Biology

Abstract: Early mortality syndrome is a reproductive disorder affecting salmonid species from the Great Lakes region. It is characterized by a thiamine deficiency in eggs due to poor maternal transfer resulting in high offspring mortality from the yolk-sac stage to the swim-up stage. To determine the prevalence and severity of low thiamine concentration, we monitored thiamine concentration in lake trout eggs from Cayuga Lake from 2009 to 2015. Initially, lake trout egg concentration was above the recommended management objective of 4 nmol/g. From 2010 to 2014, eggs from most of the females were below the threshold and averaged a concentration of 1.9 nmol/g. An increase of thiamine concentration was observed in 2015 (9.0 ± 5.7 nmol/g) but large variations were observed among females. These results indicate that thiamine deficiency is prevalent in Cayuga Lake and is an impediment to lake trout natural reproduction. ***(Professional)***